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(54) **COOLING SYSTEM APPARATUS FOR A VEHICLE**

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B60K 11/00 (2006.01)

(52) **U.S. Cl.**
USPC **180/68.4**

(58) **Field of Classification Search**
USPC 180/68.4, 68.6; 165/41, 73; 123/41.49, 123/41.55
See application file for complete search history.

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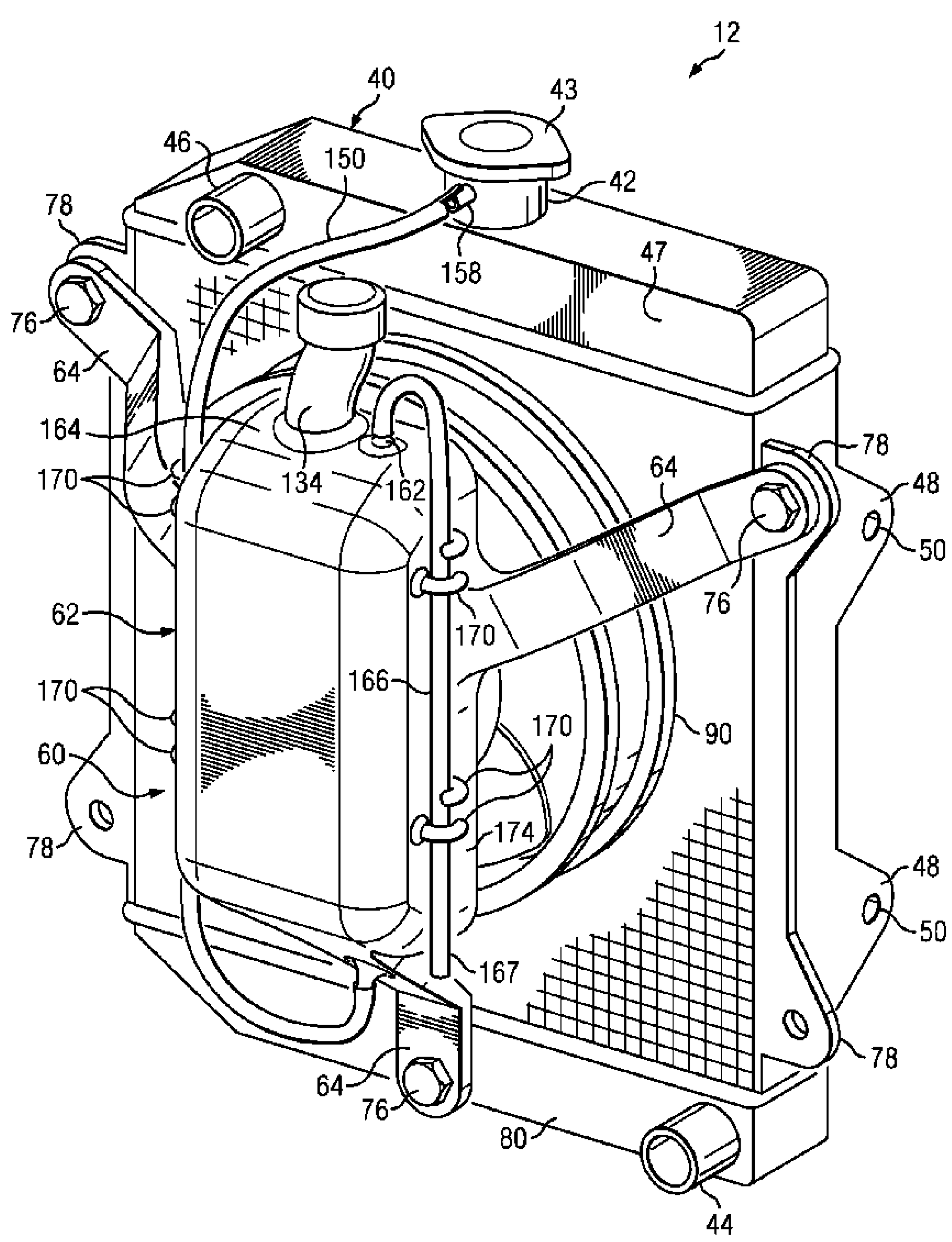
(57) **ABSTRACT**

A cooling system apparatus for a vehicle includes a reserve tank and a plurality of legs extending outwardly from the reserve tank. The reserve tank defines a chamber and each of the legs is configured for attachment to a radiator of a vehicle. The reserve tank and the legs are integrally formed as a unitary structure.

16 Claims, 7 Drawing Sheets



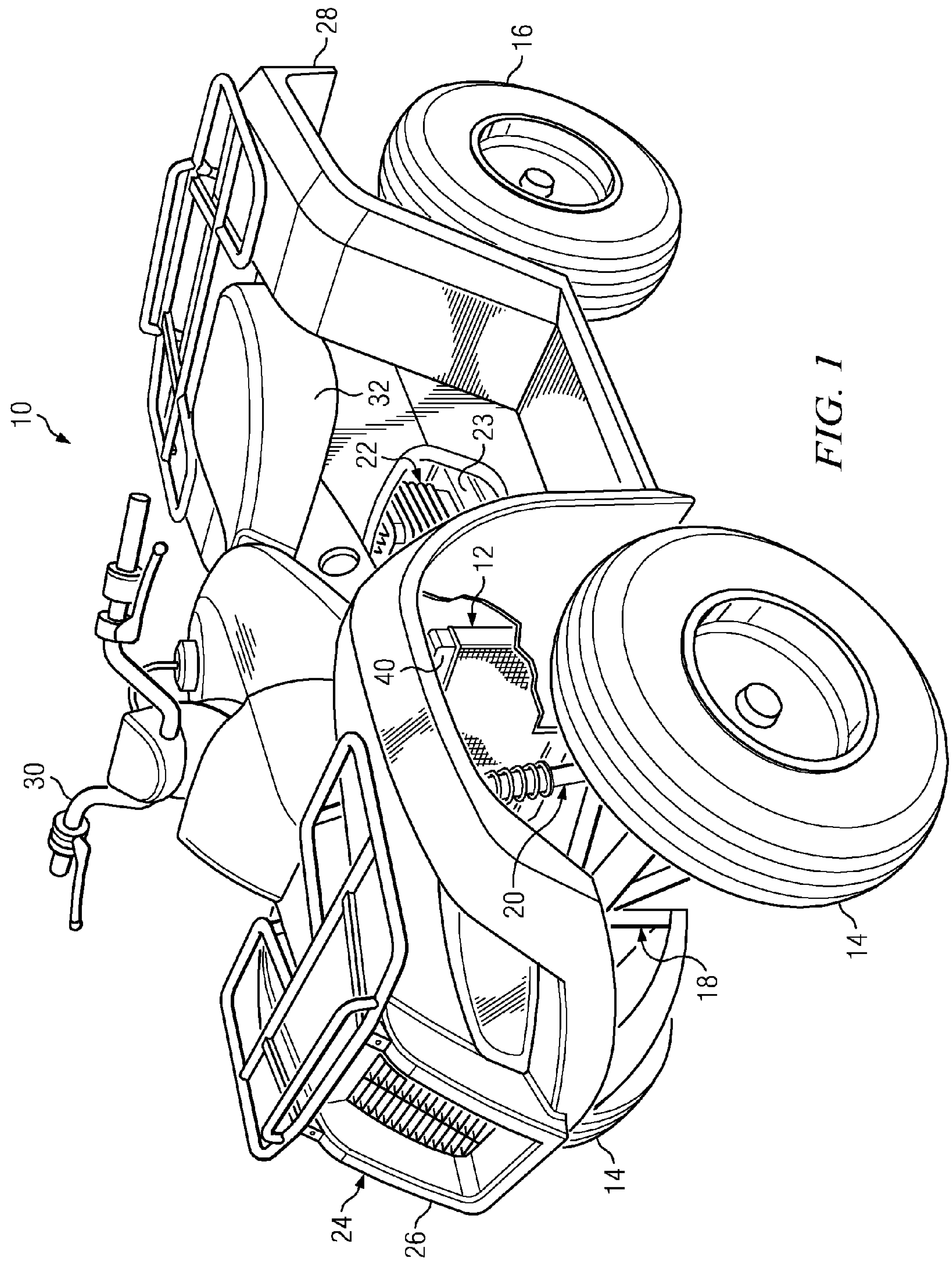
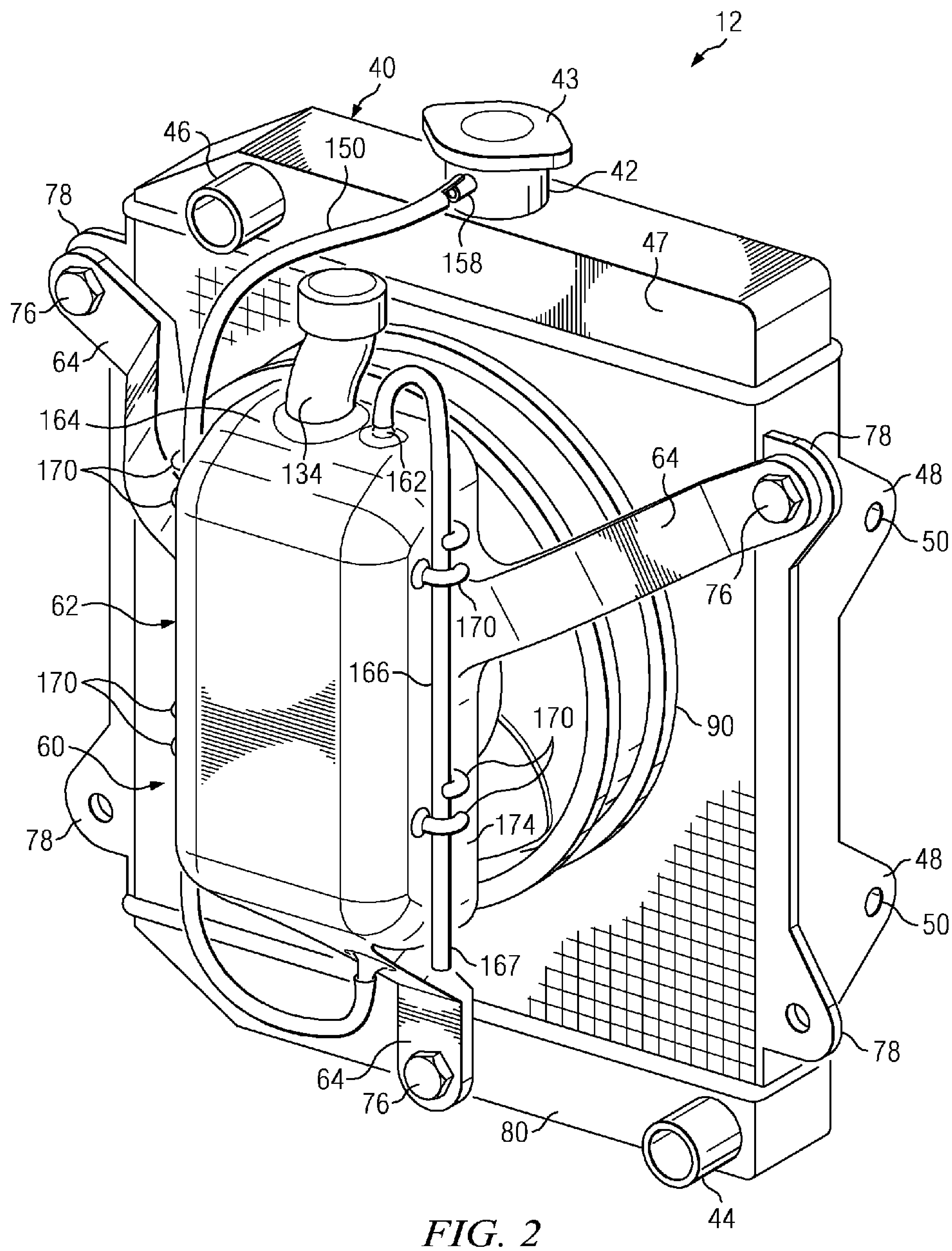


FIG. 1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166
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80
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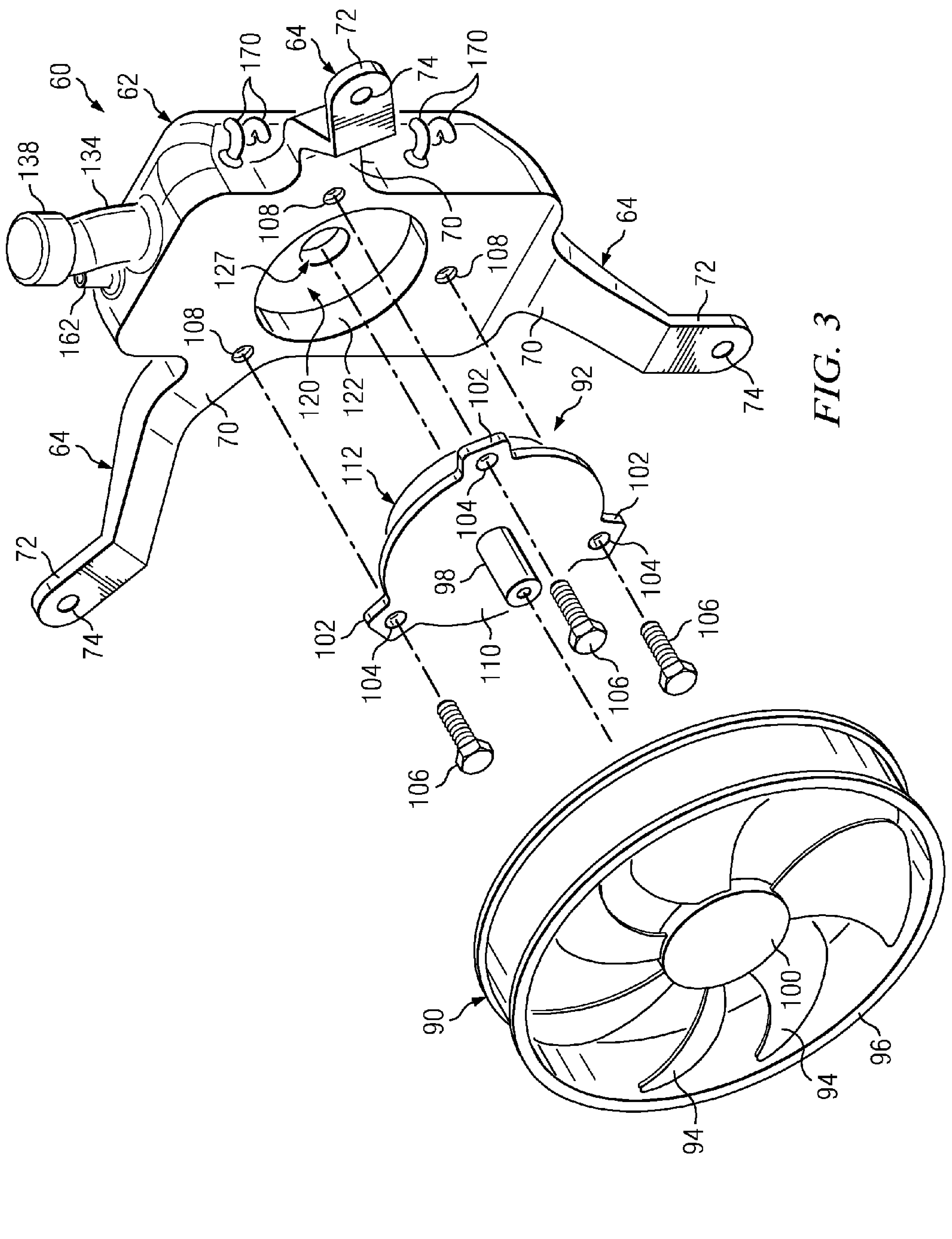
FIG. 2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162
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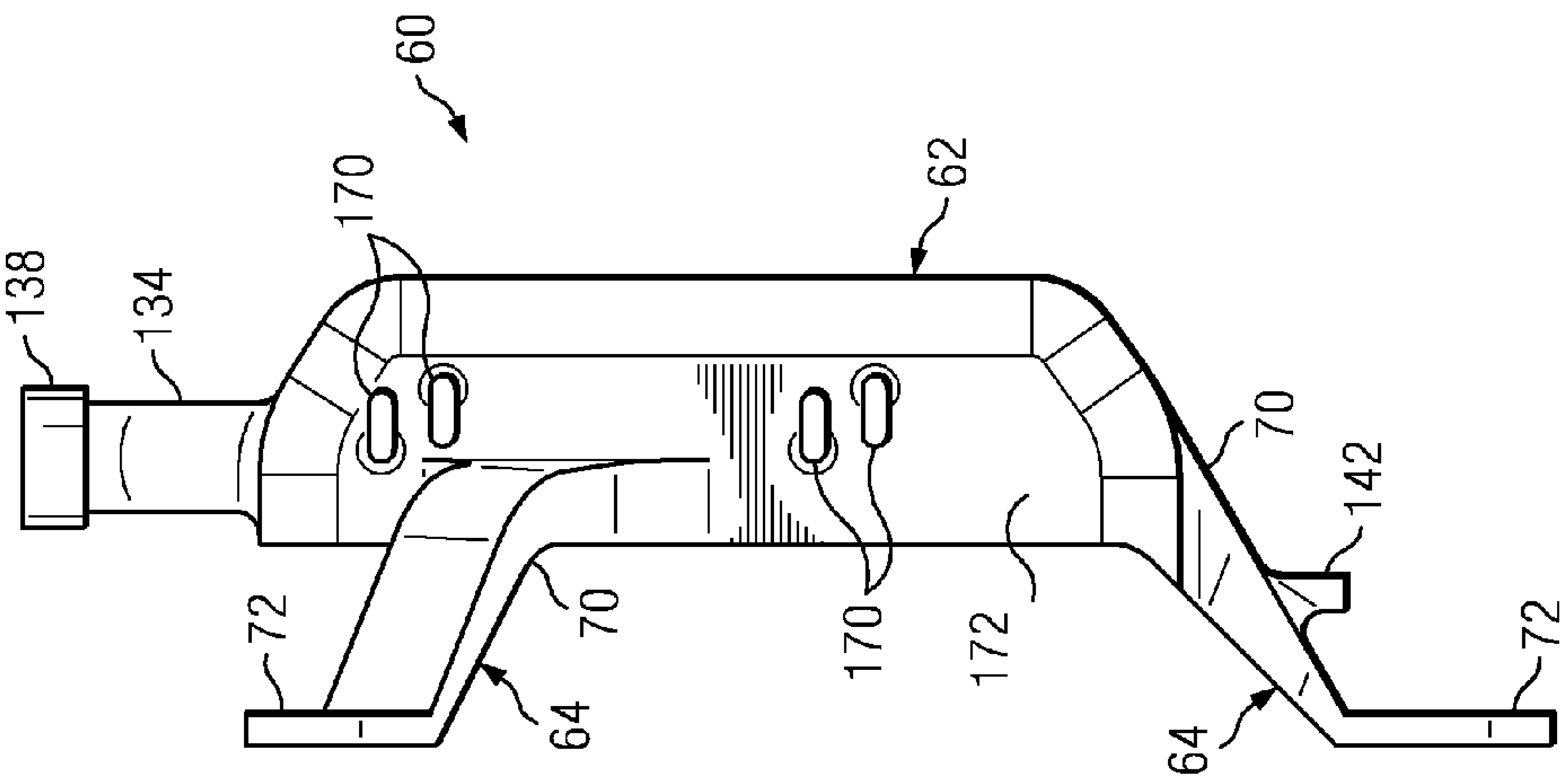
FIG. 3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62
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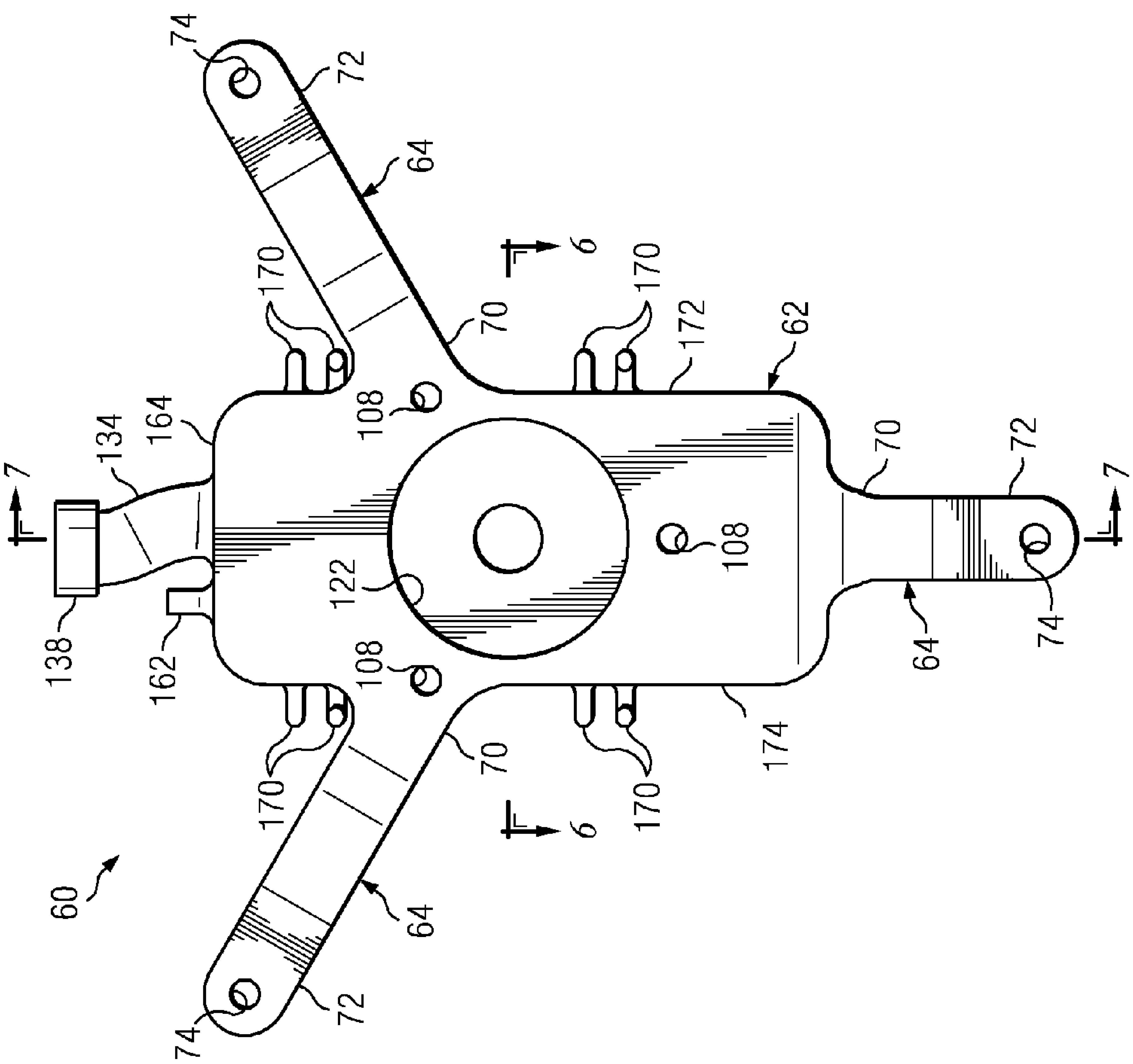
FIG. 5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64
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6
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74

FIG. 4

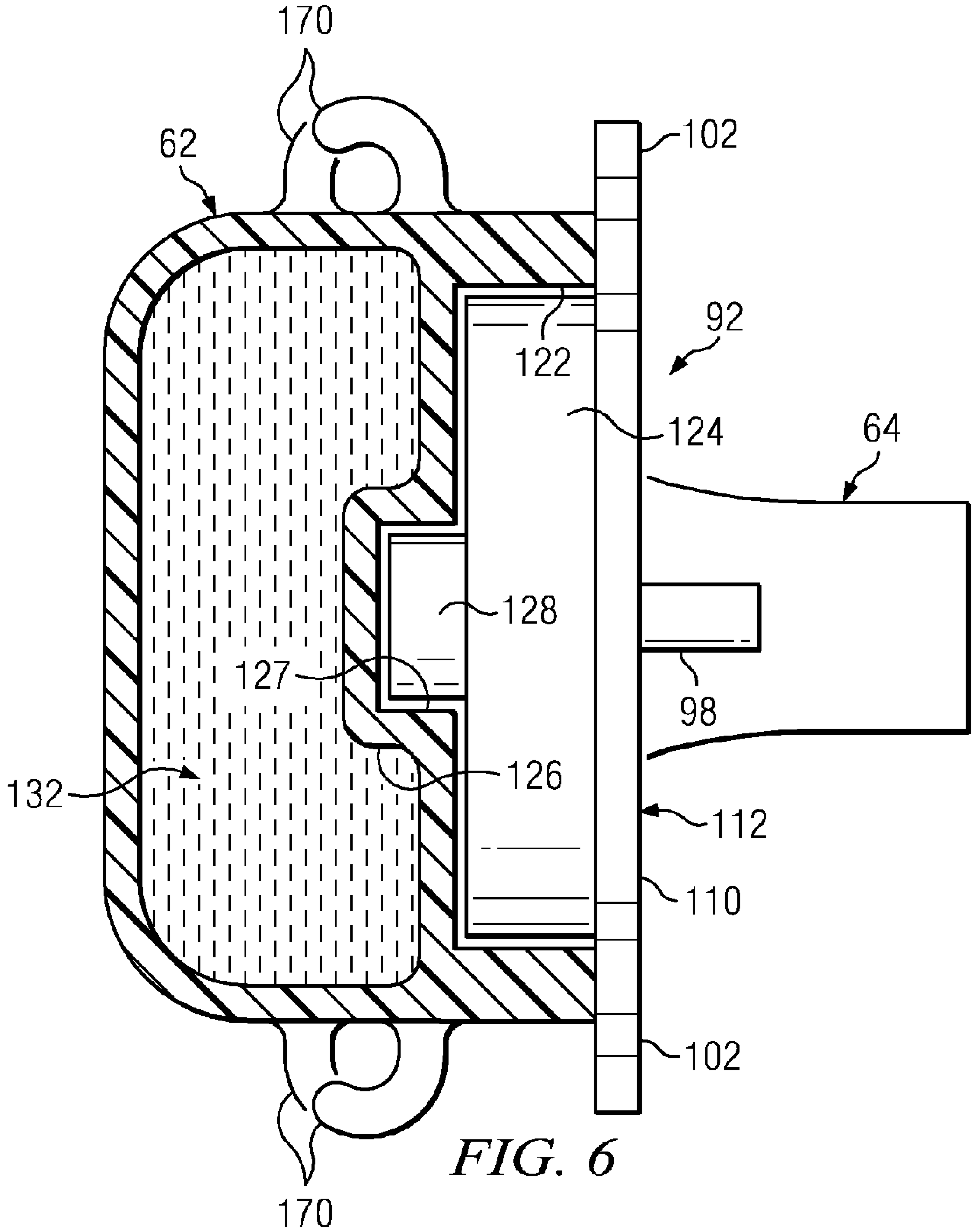
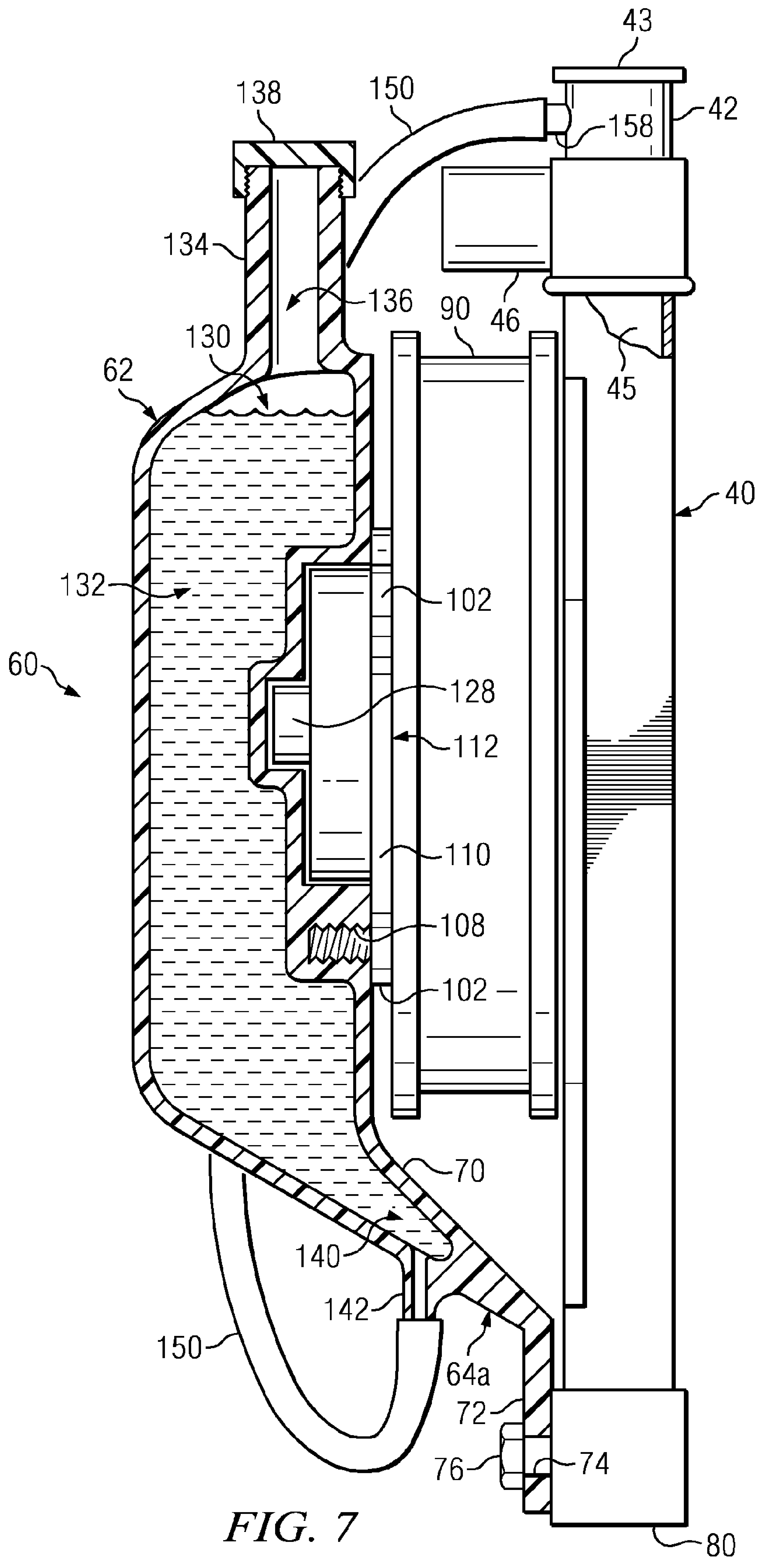


FIG. 6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130
62
45
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132
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70
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142
150
64a
72
76
74
80

FIG. 7

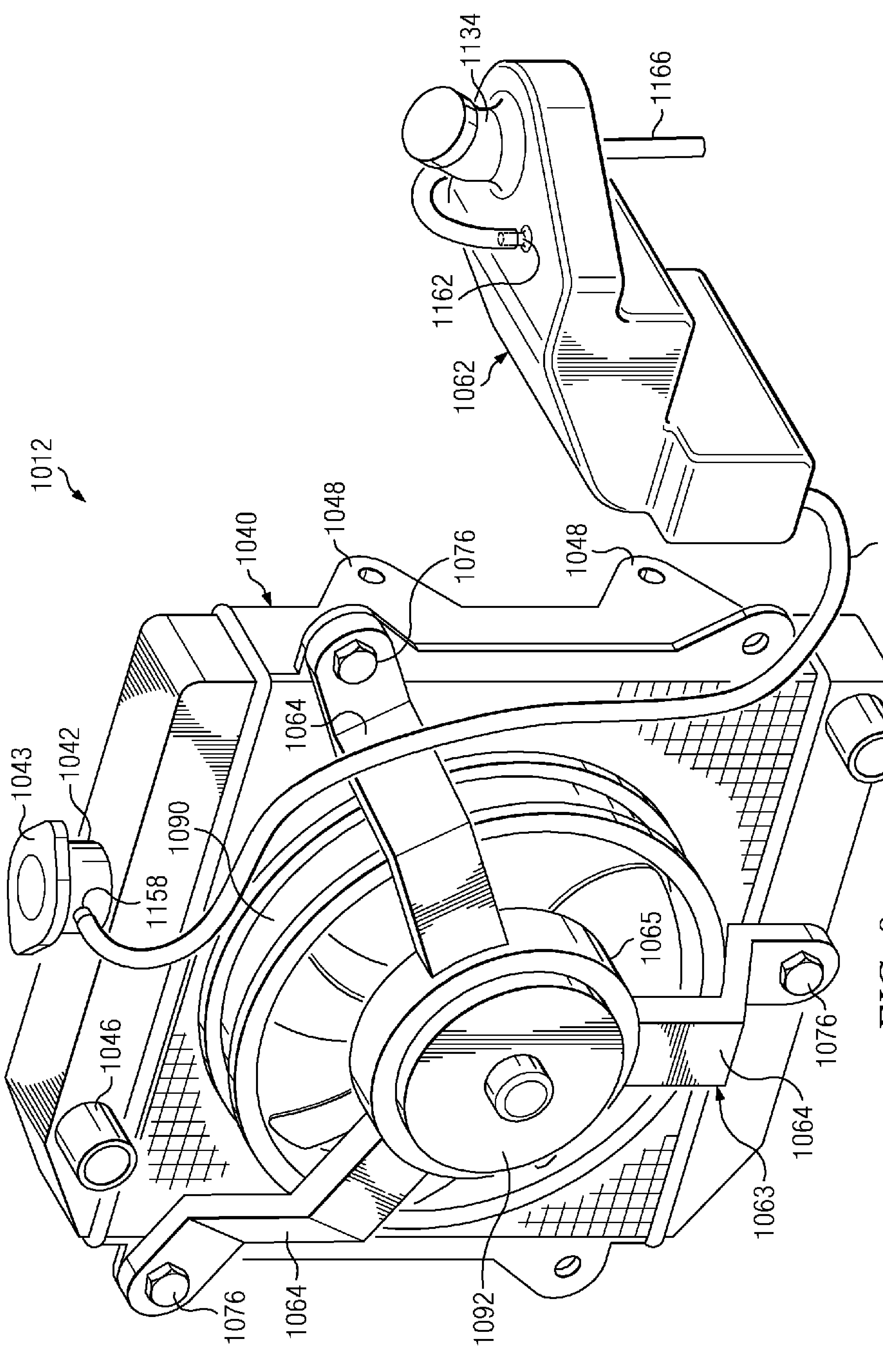

FIG. 8
(PRIOR ART)

COOLING SYSTEM APPARATUS FOR A VEHICLE

TECHNICAL FIELD

The invention relates generally to cooling systems, and more particularly to cooling systems for vehicles.

BACKGROUND

Vehicles using internal combustion engines as a source of motive power often include cooling systems to pump cooling fluid, e.g., ethylene glycol, through a block of the engine to absorb heat and prevent problems such as engine overheating and seizure. Conventional cooling systems in vehicles of this type include those having an air-cooled radiator to remove heat from the cooling fluid after it discharges from the engine block, and a separate reserve tank for the cooling fluid, with the radiator and reserve tank being in fluid communication via a flexible hose. As the cooling fluid is heated and cooled, it expands and contracts, which results in variation of a level of cooling fluid within the reserve tank.

As the vehicle moves forward, ambient air impacts the front of the radiator, which cools the cooling fluid within the radiator. The process of removing heat from the cooling fluid can be accelerated, at least during selected vehicle operating conditions, by operating a fan that is positioned adjacent to the radiator.

SUMMARY

According to one embodiment, a cooling system apparatus for a vehicle is provided. The cooling system apparatus includes a reserve tank and a plurality of legs extending outwardly from the reserve tank. The reserve tank defines a first chamber. Each of the legs is configured for attachment to a radiator of a vehicle. The reserve tank and the legs are integrally formed as a unitary structure.

According to another embodiment, a cooling system for a vehicle is provided. The cooling system includes a radiator, a fan blade assembly, a fan motor coupled to the fan blade assembly and operable for rotating the blade assembly, a reserve tank and a plurality of legs extending outwardly from the reserve tank. Each of the legs is attached to the radiator. The radiator defines a first chamber and the reserve tank defines a second chamber in fluid communication with the first chamber. The reserve tank and the legs are integrally formed as a unitary structure and the fan motor is attached to the unitary structure.

According to another embodiment, a vehicle is provided that includes a frame and a cooling system supported by the frame. The cooling system includes a radiator, a fan blade assembly, a fan motor coupled to the fan blade assembly and operable for rotating the fan blade assembly, and a cooling apparatus comprising a reserve tank and a plurality of legs extending outwardly from the reserve tank. The radiator defines a first chamber and the reserve tank defines a second chamber in fluid communication with the first chamber. The fan motor is attached to the cooling apparatus and at least one of the legs is attached to the radiator. The reserve tank and the legs are integrally formed as a unitary structure.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments will become better understood with regard to the following description, appended claims and accompanying drawings wherein:

FIG. **1** is a perspective view of a vehicle that includes a cooling system according to one embodiment, with a portion of the left front fender assembly of the vehicle not shown to illustrate a portion of the cooling system;

FIG. **2** is a rear perspective view of the cooling system of FIG. **1**, wherein a portion of an included conduit is partially broken away for purposes of illustration;

FIG. **3** is a front exploded assembly view of a portion of the cooling system shown in FIG. **2**;

FIG. **4** is a front elevation view of a portion of the cooling system shown in FIG. **2**;

FIG. **5** is a side elevation view of the portion of the cooling system shown in FIG. **4**;

FIG. **6** is a cross-sectional view taken along line **6-6** in FIG. **4** and in association with a fan motor of the cooling system shown in FIG. **2**;

FIG. **7** is a cross-sectional view taken along line **7-7** in FIG. **4** and in association with the fan motor, a fan blade assembly, and a radiator of the cooling system shown in FIG. **2**; and

FIG. **8** is a rear perspective view of a Prior Art cooling system.

DETAILED DESCRIPTION

FIG. **1** illustrates a saddle-type vehicle **10** that can include a cooling system, indicated generally at **12**, according to one embodiment. The saddle-type vehicle **10** is shown to be an all terrain vehicle (ATV). However, cooling systems can be provided that can be used with other saddle-type vehicles, or with a variety of other types of land, water or other vehicles.

Vehicle **10** can include two rotatable front wheels **14** and two rotatable rear wheels **16** (one shown). The front wheels **14** and rear wheels **16** can be suspended from a frame **18** and can be rotatable relative to frame **18**. The front wheels **14** can be suspended from frame **18** using any of a variety of conventional suspension systems, such as suspension system **20** shown partially in FIG. **1**. Vehicle **10** can further include a source of motive power **22**, which is shown to be an internal combustion engine in FIG. **1**. In other embodiments, cooling systems can be provided in association with other suitable sources of motive power, e.g., one or more electric motors, or in association with other components of a motor vehicle that require cooling, e.g., transmissions, gearboxes, batteries and power steering systems. The source of motive power **22** can be coupled to the front wheels **14** and/or the rear wheels **16**. For example, the source of motive power **22** can be drivingly coupled to a drivetrain (not shown) that can be operable for transferring torque to the front wheels **14** and/or the rear wheels **16**.

Vehicle **10** can also include a body **24** that can be supported by frame **18**. The body **24** can include a front fender assembly **26** and a rear fender assembly **28**. As shown in FIG. **1** with respect to the left front wheel **14** and the left rear wheel **16**, the front fender assembly **26** can be adjacent to and at least partially cover each of the front wheels **14**, and the rear fender assembly **28** can be adjacent to and at least partially cover each of the rear wheels **16**. Vehicle **10** can further include a handlebar assembly **30** coupled to the front wheels **14**, which can be used by an operator of vehicle **10** to facilitate steering the front wheels **14**. Vehicle **10** can further include a seat **32** that can be used to support an operator of vehicle **10**.

Referring to FIG. **2**, the cooling system **12** can include a radiator **40** that can be attached, either directly or indirectly, to the frame **18**. The radiator **40** can include an inlet port **42** and a fill cap **43** that can be removably secured to the inlet port **42**. The inlet port **42** can define a passageway (not shown). When fill cap **43** is removed, cooling fluid, e.g., ethylene glycol, can be poured into and through the passageway defined by inlet port **42** into a chamber **45** (FIG. **7**) defined by radiator **40**. Radiator **40** can be configured in any suitable manner known in the art to permit cooling fluid to flow through radiator **40**, from chamber **45** to an outlet port **44**, and to facilitate cooling the cooling fluid as it flows through radiator **40** during operation of vehicle **10**.

The cooling fluid can discharge from the radiator **40** through the outlet port **44**. The source of motive power **22** can include a block shown generally at **23** in FIG. **1**, and the outlet port **44** of radiator **40** can be in fluid communication with fluid passages (not shown) defined by the block in any suitable manner, e.g., via one or more conduits (not shown) and a pump (not shown). The cooling fluid can flow through the block **23** of the source of motive power **22**, and can cool the source of motive power **22**, during operation of vehicle **10**. Cooling fluid discharging from the block of the source of motive power **22** can flow through one or more suitable fluid flow components, e.g., one or more conduits (not shown) to a return port **46** of radiator **40**.

Radiator **40** can include a plurality of forward mount flanges **48** (two shown) which can be used to attach radiator **40**, either directly or indirectly, to frame **18**. For example, radiator **40** can include two or more of the forward mount flanges **48** protruding from each side of radiator **40**. Each forward mount flange **48** can include one or more apertures **50**, and a male fastener (not shown) can be inserted through a respective aperture **50** and a mating aperture (not shown) in frame **18** or a mating aperture in a structure, such as a bracket, secured to frame **18**. Such male fasteners can be secured with female fasteners or can be secured using threaded apertures in frame **18** or in a structure secured to frame **18**.

Cooling system **12** can further include an apparatus **60** that can be attached to the radiator **40**. Apparatus **60** can include a reserve tank **62** and a plurality of legs **64** extending outwardly from the reserve tank **62**. The reserve tank **62** and each of the legs **64** can be integrally formed as a unitary structure. In one embodiment, the reserve tank **62** and the legs **64** can be molded, using any suitable molding process, e.g., blow molding. The reserve tank **62** and the legs **64** can be formed from a polymeric material, which can be a thermoplastic material. Suitable polymeric materials include, but are not limited to, polyethylene and polypropylene.

Each of the legs **64** can include a proximal end portion **70** (FIG. **3**) that can be integral with the reserve tank **62** and can further include a distal end portion **72** (FIG. **3**) that can be configured for attachment to the radiator **40**. For example, the distal end portion **72** of each leg **64** can define an aperture **74** that can be sized and configured to receive a male fastener, e.g., bolt **76** (FIG. **2**). Each bolt **76** can be inserted through a respective one of the apertures **74** and into a mating and aligned aperture (not shown) defined by radiator **40**, e.g., an aperture defined by one of a plurality of rear mount flanges **78** of radiator **40** or an aperture defined by a bottom portion **80** of radiator **40**. Each bolt **76** can be secured by a respective female fastener (not shown), e.g., a nut, or alternatively each bolt **76** can be threaded into a mating aperture of radiator **80** having internal threads. The cooling apparatus **60** is shown in FIG. **2** to be attached to a rear side **47** of radiator **40**. However, in other embodiments cooling apparatus can be provided that include a reserve tank and a plurality of legs integrally formed with the reserve tank as a unitary structure, which can be attached to a front side of a radiator.

As shown in FIG. **3**, the cooling system **12** can also include a fan blade assembly **90** and a fan motor **92**. The fan blade assembly **90** can include a hub **100** and a plurality of fan blades **94** that can extend radially outwardly from the hub **100**. The fan blade assembly **90** can also include an annular fan casing **96**, and a radially outer end of each of the fan blades **94** can be secured to the fan casing **96**. The fan motor **92** can be coupled to the fan blade assembly **90**. For example, the fan motor **92** can include a rotatable output shaft **98** that can be drivingly coupled to the hub **100** of the fan blade assembly **90**, such that the fan motor **92** can be operable for rotating the fan blade assembly **90**. A fan blade assembly can be provided in any of a variety of suitable alternative shapes and configurations.

The fan motor **92** can be attached to the reserve tank **62** and/or to one or more of the legs **64** of the apparatus **60**. The fan motor **92** can include a plurality of mount tabs **102**, with each mount tab **102** defining an aperture **104** that can be sized and configured to receive a male fastener, e.g., bolt **106**. Each bolt **106** can be secured to apparatus **60**. For example, each bolt **106** can be threaded into a threaded aperture **108** defined by reserve tank **62**. In other embodiments, each bolt **106** can be secured to a respective one of the legs **64**, e.g., by threading each bolt **106** into a threaded aperture (not shown) defined by a respective one of the legs **64**. In other embodiments, one or more of the bolts **106** can be threaded into a mating aperture defined by the reserve tank **62**, e.g., aperture **108**, and one or more of the bolts **106** can be threaded into an aperture defined by a respective one of the legs **64**. The mount tabs **102** can extend outwardly from a base portion **110** of a housing **112** of the fan motor **92**. The mount tabs **102** can extend generally radially outwardly from the base portion **110** as shown in FIG. **3**.

The reserve tank **62** of apparatus **60** can define an open cavity **120** and at least a portion of the fan motor **92** can be disposed within cavity **120**. Referring to FIGS. **3** and **6**, the reserve tank **62** can include a generally cylindrical surface **122** that can at least partially define the cavity **120**, and that can surround, or at least partially surround, a generally cylindrical portion **124** of housing **112** of fan motor **92** that can be disposed within cavity **120**. The reserve tank **62** can include a recessed portion **126** that can define a cavity **127** that can communicate with cavity **120** and that can be sized and configured such that a protruding portion **128** of housing **112** of fan motor **92** can be disposed within cavity **127**. The protruding portion **128** of housing **112** can be integral with, and can extend from, the generally cylindrical portion **124** of housing **112**. One end of the output shaft **98** of fan motor **92** can be journalled within the protruding portion **128** of housing **112**.

The reserve tank **62** can define a chamber **130** (FIG. **7**) that can be configured to receive and contain a cooling fluid **132**, e.g., ethylene glycol. The reserve tank **62** can include an inlet port **134** that can define a passageway **136** that can be in fluid communication with the chamber **130**. A cap **138** can be removably secured to the inlet port **134**. In one embodiment, cap **138** and inlet port **134** can have mating threads (not shown). When cap **138** is removed from inlet port **134**, a fluid, e.g., cooling fluid **132**, can be poured into and through passageway **136** into chamber **130**.

One or more of the legs **64** can be at least partially hollow to supplement the capacity of cooling apparatus **60** to contain cooling fluid. In one embodiment, a bottom one of the legs **64**, identified as **64*a*** in FIG. **7**, can be at least partially hollow and can define a chamber **140**. Chamber **140** can be in fluid communication with chamber **130** defined by the reserve tank **62**. The bottom leg **64*a*** can include an outlet port **142** that can at least partially define chamber **140**. The outlet port **142** can be open at a lower end, which allows cooling fluid **132** within chambers **130** and **140** to discharge from cooling apparatus **60** through the outlet port **142**.

Radiator **40** can also include an overflow port **158** that can be secured to the inlet port **42**. Overflow port **158** can define a passageway (not shown) that can be in fluid communication with the passageway (not shown) defined by the inlet port **42**, such that fluid can flow through the overflow port **158**, either to or from the interior chamber **45** defined by radiator **40**. A conduit **150**, which can be a flexible conduit, can be attached at one end to the outlet port **142** of the bottom leg **64***a* and can be attached at the other end to the overflow port **158**, such that chambers **130** and **140** of the cooling apparatus **60** can be in fluid communication with the chamber **45** defined by radiator **40**. This end of conduit **150** is partially broken away in FIG. **2** to reveal the overflow port **158**.

The reserve tank **62** can further include a vent **162** that can protrude from an upper end **164** of the reserve tank **62**, as shown in FIGS. **2** and **4**. The vent **162** can be a hollow nipple that defines a passageway (not shown) that can be in fluid communication with the chamber **130** defined by the reserve tank **62**. A conduit **166** (FIG. **2**), which can be a flexible conduit, can be attached at one end to the vent **162** such that any fluid that discharges from the vent **162** can flow through the conduit **166**, which can have a lower end **167** directed toward a ground surface (not shown). In an alternative embodiment, a vent cap (not shown) can be provided that can be configured, and can include a one-way permeable material e.g., Gore-Tex®, to permit fluid to flow from chamber **130** outward through the material but prevent, or at least substantially prevent, fluid from flowing through the material into chamber **130**.

Referring to FIGS. **2-5**, reserve tank **62** can include a plurality of tabs **170**. A first plurality of the tabs **170** can protrude outwardly from a first side **172** of the reserve tank **62**, and a second plurality of the tabs **170** can protrude outwardly from a second side **174** of the reserve tank **62**. The tabs **170** that protrude outwardly from the first side **172** of the reserve tank **62** can releasably secure the conduit **150** to reserve tank **62**. The tabs **170** that protrude outwardly from the second side **174** of reserve tank **62** can releasably secure the conduit **166** to reserve tank **62**.

Prior Art FIG. **8** illustrates a conventional cooling system **1012** that includes a radiator **1040** and a reserve tank **1062**. The radiator **1040** includes an inlet port **1042**, an outlet port **1044** and a return port **1046**. Radiator **1040** further includes a plurality of mount flanges **1048** that are used to secure radiator **1040** to the frame of a vehicle, e.g., by using conventional fasteners. Radiator **1040** also includes an overflow port **1158** that is secured to the inlet port **1042**. Overflow port **1158** defines a passageway (not shown) that is in fluid communication with a passageway (not shown) defined by the inlet port **1042**. The passageway defined by the inlet port **1042** is in fluid communication with an interior chamber (not shown) defined by radiator **1040**.

A fill cap **1043** is removably secured to the inlet port **1042**. When fill cap **1043** is removed, coolant fluid, e.g., ethylene glycol, can be poured into and through the passageway defined by the inlet port **1042** into the chamber defined by the radiator **1040**. A conduit **1150** is attached at one end to the overflow port **1158** of radiator **1040**. The opposite end of conduit **1150** is attached to an outlet port (not shown) of the reserve tank **1062**. During operation of a vehicle associated with the cooling system **1012**, as cooling fluid within radiator **1040** is heated, the cooling fluid can expand such that a portion of the cooling fluid can flow through conduit **1150** and into the reserve tank **1062**. As the cooling fluid cools, some of the cooling fluid can return from the reserve tank **1062** to radiator **1040** through conduit **1150**. The reserve tank **1062** includes an inlet port **1134** and a vent **1162**, and a conduit **1166** is attached at one end to the vent **1162**.

Cooling system **1012** further includes a fan stay **1063**, a fan blade assembly **1090** and a fan motor **1092**. Fan blade assembly **1090** includes a plurality of fan blades and a fan casing surrounding the fan blades. The fan motor **1092** is coupled to the fan blade assembly **1090**, e.g., a rotatable output shaft of the fan motor **1092** is coupled to a hub (not shown) of the fan blade assembly **1090**, such that the fan motor **1092** is operable for rotating the fan blade assembly **1090**.

The fan stay **1063** includes an inner annular hub **1065** and a plurality of legs **1064** that extend outwardly from the inner annular hub **1065**. Each of the legs **1064** is attached to radiator **1040** with bolts **1076**. The fan motor **1092** is attached to the fan stay **1063** using a plurality of conventional fasteners (not shown), such that the inner annular hub **1065** of fan stay **1063** surrounds a portion of the fan motor **1092**, as shown in FIG. **8**. The fan motor **1092** includes a plurality of mount tabs (not shown), with each mount tab defining an aperture that is sized and configured to receive a respective bolt (not shown). Each of the bolts is secured to the fan stay **1063**, which releasably attaches the fan motor **1092** to the fan stay **1063**. In conventional cooling system **1012**, the reserve tank **1062** and fan stay **1063** are not manufactured integrally as a unitary structure. Instead, the reserve tank **1062** is manufactured separately from the fan stay **1063** and is typically positioned in an associated vehicle at a location spaced apart from the fan stay **1063**, as shown generally in FIG. **8**.

In contrast to the reserve tank **1062** and fan stay **1063** of conventional cooling system **1012**, the reserve tank **62** and legs **64** of cooling apparatus **60** of cooling system **12** can be integrally formed, e.g., from a polymeric material, as a unitary structure, while maintaining the corresponding dual function of supporting the fan motor **92** and providing the reserve tank **62** to receive cooling fluid from a radiator of a vehicle, e.g., radiator **40** of vehicle **10**, as the cooling fluid is heated during operation of a vehicle. Cooling fluid can be drawn into the radiator **40** from reserve tank **62** as the cooling fluid cools. Forming reserve tank **62** and legs **64** as a unitary structure can result in a reduced number of parts, reduced assembly time, and reduced weight, relative to conventional cooling systems such as cooling system **1012**, wherein each of these reductions can result in a cost reduction relative to the use of a conventional cooling system, such as cooling system **1012**.

While various embodiments of a cooling system apparatus for a vehicle, a cooling system for a vehicle, and a vehicle, have been illustrated by the foregoing description and have been described in considerable detail, it is not intended to restrict or in any way limit the scope of the appended claims to such detail. Additional modifications will be readily apparent to those skilled in the art.

What is claimed is:

1. A cooling system apparatus for a vehicle, the cooling system apparatus comprising:

a reserve tank defining a first chamber and a first cavity; and

a plurality of legs extending outwardly from the reserve tank, each of the legs being configured for attachment to a radiator of a vehicle; wherein

the reserve tank and the legs are integrally formed as a unitary structure;

a bottom one of the legs defines a second chamber in fluid communication with the first chamber;

the reserve tank comprises a recessed portion that defines a second cavity in communication with the first cavity;

the bottom one of the legs comprises an outlet port, the outlet port comprising a lower end, the lower end of the outlet port being open to allow cooling fluid within the first chamber and the second chamber to discharge through the outlet port; and

each of the first cavity and the second cavity is configured to receive a respective portion of a housing of a fan motor.

2. The cooling system apparatus of claim **1**, wherein:

each of the legs comprises a proximal end portion and a distal end portion;

the proximal end portion of each of the legs is integral with the reserve tank and, for each of the legs, the distal end portion defines an aperture configured to receive a male fastener to facilitate attaching the legs to a radiator; and

the reserve tank defines at least one aperture configured to receive a male fastener to facilitate attaching a fan motor to the reserve tank.

3. The cooling system apparatus of claim **2**, wherein:

the reserve tank comprises an inlet port, the inlet port defining a passageway in fluid communication with the first chamber; and

the reserve tank further comprises a vent.

4. The cooling system apparatus of claim **2**, wherein:

the reserve tank further comprises a generally cylindrical surface that at least partially defines the first cavity and is configured to surround the at least a portion of a fan motor.

5. The cooling system apparatus of claim **1**, wherein:

the reserve tank and the legs are integrally formed from a polymeric material.

6. A cooling system for a vehicle, the cooling system comprising:

a radiator;

a fan blade assembly;

a fan motor coupled to the fan blade assembly and operable for rotating the fan blade assembly;

a reserve tank; and

a plurality of legs extending outwardly from the reserve tank, each of the legs being attached to the radiator; wherein

the radiator defines a first chamber and the reserve tank defines a second chamber in fluid communication with the first chamber;

the reserve tank and the legs are integrally formed as a unitary structure;

the fan motor is attached to the unitary structure;

the reserve tank defines at least one cavity;

at least a portion of the fan motor is disposed within the at least one cavity;

the at least one cavity comprises a first cavity and a second cavity in communication with the first cavity;

the reserve tank comprises a generally cylindrical surface and a recessed portion, the generally cylindrical surface at least partially defining the first cavity, the recessed portion defining the second cavity;

the fan motor comprises a rotatable output shaft drivingly coupled to the fan blade assembly and further comprises a housing, the housing comprising a generally cylindrical portion and a protruding portion integral with, and extending from, the generally cylindrical portion;

the generally cylindrical portion of the housing of the fan motor is disposed within the first cavity and is at least partially surrounded by the generally cylindrical surface of the reserve tank; and

the protruding portion of the housing of the fan motor is disposed within the second cavity.

7. The cooling system of claim **6**, wherein:

the plurality of legs comprises a bottom leg, the bottom leg defining a third chamber in fluid communication with the second chamber defined by the reserve tank and the first chamber defined by the radiator.

8. The cooling system of claim **7**, further comprising:

a first conduit that facilitates fluid communication between the third chamber defined by the one of the legs and the first chamber defined by the radiator.

9. The cooling system of claim **8**, wherein:

the bottom leg comprises an outlet port;

the radiator comprises an inlet port and an overflow port secured to the inlet port;

the first conduit comprises a first end attached to the outlet port of the one of the legs and a second end attached to the overflow port of the radiator; and

the outlet port of the one of the legs, the first conduit, and the overflow port and the inlet port of the radiator cooperate to establish fluid communication between the third chamber defined by the one of the legs and the first chamber defined by the radiator.

10. The cooling system of claim **9**, further comprising:

a second conduit; wherein

the reserve tank comprises a vent;

the second conduit is attached, at one end thereof, to the vent; and

the reserve tank and the legs are integrally formed from a polymeric material.

11. The cooling system of claim **7**, wherein:

the one of the legs comprises a bottom leg.

12. A vehicle comprising:

a frame; and

a cooling system supported by the frame, wherein the cooling system comprises:

a radiator, the radiator defining a first chamber;

a fan blade assembly;

a fan motor coupled to the fan blade assembly and operable for rotating the fan blade assembly; and

an apparatus comprising a reserve tank and a plurality of legs extending outwardly from the reserve tank; wherein

the reserve tank defines a second chamber in fluid communication with the first chamber;

at least one of the legs is attached to the radiator;

the reserve tank and the legs are integrally formed as a unitary structure;

the fan motor is attached to the unitary structure;

one of the legs defines a third chamber in fluid communication with the second chamber defined by the reserve tank and with the first chamber defined by the radiator;

the fan motor comprises a housing, the housing comprising a generally cylindrical portion and a protruding portion integral with, and extending from, the generally cylindrical portion;

the reserve tank comprises a generally cylindrical surface and a recessed portion;

the generally cylindrical surface of the reserve tank at least partially defines a first cavity and at least partially surrounds the generally cylindrical portion of the housing of the fan motor;

the recessed portion of the reserve tank defines a second cavity; and

the second cavity is in communication with the first cavity, the protruding portion of the housing of the fan motor being disposed within the second cavity.

13. The vehicle of claim **12**, further comprising:

a first conduit that facilitates fluid communication between the third chamber defined by the one of the legs and the first chamber defined by the radiator.

14. The vehicle of claim **13**, wherein:

the first conduit comprises a first end and a second end;

the one of the legs comprises an outlet port;

the radiator comprises an inlet port and an overflow port secured to the inlet port; and

the first end of the first conduit is attached to the outlet port of the one of the legs and the second end of the first conduit is attached to the overflow port of the radiator, such that the outlet port of the one of the legs, the first conduit, and the overflow port and the inlet port of the radiator cooperate to establish fluid communication between the third chamber defined by the one of the legs and the first chamber defined by the radiator.

15. The vehicle of claim **14**, further comprising:

a second conduit; wherein

the reserve tank comprises a vent;

the second conduit is attached to the vent; and

the reserve tank and the legs are integrally formed from a polymeric material.

16. The vehicle of claim **12**, further comprising:

at least one front wheel suspended from the frame and rotatable relative to the frame;

at least one rear wheel suspended from the frame and rotatable relative to the frame; and

a source of motive power coupled to at least one of the at least one front wheel and the at least one rear wheel; wherein

the cooling system operably facilitates cooling the source of motive power.

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